Macro-economic implications of profit optimizing investment behaviour

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RESEARCH MEMORANDUM

MACRO-ECONOMIC IMPLICATIONS OF PROFIT OPTIMIZING INVESTMENT BEHAVIOUR

Hans J. Gremmen

FEW 431

MACRO-ECONOMIC IMPLICATIONS OF PROFIT OPTIMIZING INVESTMENT BEHAVIOUR

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I Introduction

Many authors assume that entrepreneurial decisions regarding investments in fixed assets are based on a strive for profit maximization. In accordance with the neo-classical micro-economic approach, they assume that investments depend on output and relative capital costs. Some examples are Kopcke [1985], Jorgenson [1963], Claassen [1980] and Scotland [1981]. Their proposition is that investments, partly or completely, close 'the gap' between the stock of capital that minimizes production costs and the actual stock of capital. The assumed behaviour is symmetric: of a positive gap a part is filled (by investments) that equals the part that is filled (by disinvestments) of a negative gap. The degree to which the gap is filled is either exogenous or depending on the expected rate of return. In both cases, this approach, however, basically ignores the existence of risk in the sense that a deviation of the actual size of a plant for a risk averter causes disutility. An expansion of the capital stock implies that more money is at stake in a risky world, a shrinking stock of capital causes a decline in the market share which may be difficult to recapture. Under these circumstances entrepreneurs will no longer strive for profit maximization, but for profit optimization.

The present article investigates the macro-economic consequences of this profit optimizing investment behaviour. First of all, it shows, that, whereas with a profit maximizing investment behaviour the economy will as a rule reach a new long run equilibrium after an impulse, with a profit optimizing investment behaviour, this need not be the case.

More importantly, it will demonstrate that the profit optimizing investment behaviour developed here, implies a negative impact of the existence of business cycles on the average capital stock. As a consequence, a government policy invoking or aggravating business cycles as such implies a negative supply shock, with negative effects on production and employment and a positive impact on inflation. The negative effects of this supply shock also spread out to other countries. As a consequence, the possibility cannot be ruled out, that, although exchange rates are fixed, a positive demand impulse in one country will on balance have negative effects on the outside world. In that case, even in a demand oriented model, a demand policy is internationally conflicting.

II The Model

To analyse the effects of the alternative investment hypotheses (profit maximizing vs. profit optimizing) both nationally and internationally, i.e., including international repercussions, we apply a symmetric macroeconomic model for more than one (in this case arbitrary four) large countries -labelled 1, 2, 3 and 4- with flexible levels of output and flexible prices. As far as unilateral impulses (say in country 1 only) are analysed the model becomes asymmetric. If all countries act equally, the results resemble those of a closed economy. First, we describe the behavioural equations of demand and supply, respectively, except for the investment functions. Next, we turn to the alternative specifications of investment behaviour.

In each country, consumer demand for home produced and imported products equals net labour income, and real material government expenditures are exogenous. Relative international prices determine the ratio of real home consumption over imports.[1] In a closed world economy, exports equal the imports by the remaining (three) countries out of the economy concerned. In production, following a Cobb-Douglas production function, firms combine under perfect competition labour and capital (both homogeneous). In the short run, the amount of labour employed may vary, whereas capital is fixed, due to an installation lag of one period of investments. Output

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1) We disregard transport costs and the like, and exchange rates are fixed and set equal to one.

prices and production are found by the intersection of demand and supply, where the latter is derived by combining the production function with the assumption of profit maximization. Given capital, the output volume determines labour demand.
Labour supply is constant. International mobility of production factors is ruled out and nominal wages (P_L) are fixed. Unemployment benefits, paid by the government, are lower than the wage rate.
In short, for country i we postulate (where N=nominal, symbols without suffix refer to the 'home' country i, all countries are structured similarly, j = 1...4):

(1) $YN = CON + IN + GN + EXN$

where Y = demand, CO = consumption of home produced goods, I = investment expenditures, EX = exports;

(2) $CON + MN = NHI$

where MN = value of imports, NHI = nominal net household income = Y_L (firm wage bill) + TRF (social security payments) - B_L (direct household taxes);

(3) $co = \frac{CON}{P_y}$

where P_y = price in home currency of home produced good;

(4) $m_{ij} = \varepsilon\ co(P_{yi}/P_{yj})$

where m_{ij} = real imports in i out of j, ε = parameter.[2)]
The production function $y = \ell^{\beta}k^{1-\beta}$ (with y = output, ℓ = private employment, k = capital stock, β = parameter) combined with profit maximization production leads to the short run supply function

2) ε is fixed, which implies an elasticity of substitution between co and m equal to 1.

$$(5) \qquad y_s = k\left(\beta \frac{P_y}{P_L}\right)^{\frac{\beta}{1-\beta}}$$

where

$$(6) \qquad k = \sum_{s=1}^{\Theta} i_{t-s}$$

with i = gross investments (installation lag = 1 period), Θ = life span.

Next, we describe the two alternative investment hypotheses, first the one based on profit maximization (cost minimization) and, secondly, the one assuming profit optimization.
For the former we need the cost minimizing ('desired') capital stock, k^*. Following Gould and Waud [1973], k^* should depend "only on exogenous quantities that are unaffected by the firm's (investment) decisions or adjustment process" (p. 35). In other words, it would be incorrect to have today's investment determined by today's output where the latter depends on the actual capital stock which is in turn, determined by the investments themselves.
To circumvent this simultaneity, we assume two time lags in the investment process. The investment decision in period t leads to the actual investment (i.e., the purchase of a machine) in t+1 [3] and, due to the installation lag referred to above, to capital accumulation in t+2. As a consequence, the investment decision of period t (i_D) is determined by the gap between the stock of capital expected to minimize production costs in t+2 (k^*) on the one hand, and the capital stock that will be obtained (in t+2) if (net) investment decisions (in t) are zero, on the other.
Following Jorgenson [1963] and Scotland [1981], for example, replacement (c.q. autonomous) investment is assumed to equal depreciation ($\frac{1}{\Theta}$ k) throughout.

3) This lag is for example also found in H.S. Tjan [1985], p.5.

Following standard price theory, k^* is determined by the expected price of capital, P_k^e, that of labour, P_L^e, and expected macro-economic output, y^e:[4)]

(7) $$k^* = y^e / \left[\left(\frac{\beta}{1-\beta} \left[\frac{P_k}{P_L} \right]^e \right)^{\beta} \right]$$

A central variable in the investment decision making process is the expected output price level, P_y^e (see also eq.(8) below). For the goods market structure we assume rational expectations with limited information (see De Jong [1988]), where 'limited information' pertains to the factors exogenous to this market. These factors are calculated applying the 'weak form of the efficient market hypothesis' (Sijben [1984]). For each of them, say x, $x^e = x(g_x^e)^2$ in which g_x^e resembles an extrapolation factor based on 'bounded memory' (Fourgeaud et al [1984]) where the most recent information regarding x gets the highest weight.[5)] This formulation is followed to get, for example, expected nominal demand, YN^e.
The rationality of the expected goods market structure prescribes that the expected output price level, P_y^e (and with it P_k^e), should subsequently be determined by the ratio of YN^e over y^e and that the latter (also by analogy with the actual product market) should be determined as:

(8)[6)] $$y^e = k^e \left[\beta \frac{P_y{}^e}{P_L{}^e} \right]^{\frac{\beta}{1-\beta}}$$

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4) All expectations discussed here refer to the expected values for two years after the current decision to invest, unless otherwise indicated.

5) We specify g_x^e as $\left(\sum_{\iota=0}^{\Theta-1} \frac{x_{t-\iota}}{x_{t-\iota-1}} (\Theta-\iota) \right) / \sum_{\iota=1}^{\Theta} \iota$.

6) Actually, the computer model used for the calculations below, also contains, both for the 'actual' and the 'expected market', a vertical branch of the short run supply curve, indicating that labour is short. As in the calculations to be shown the rate of unemployment stays positive, we leave this branch out here.

To prevent the simultaneity problem of Gould and Waud (see above), in (8) k^e (the expected macro-economic capital stock) should be determined separately from the current investment decision. We assume that entrepreneurs expect that next period's investments (i.e., this period's investment decisions) equal actual (current) investments corrected for the expected growth in real final demand.

Formally,

$$(9) \qquad k^e = k - i_{t-\Theta} - i_{t-\Theta+1} + i_t + i^e_{t+1}$$

where $i^e_{t+1} = (g^e_{FD} \cdot i)$, in which g^e_{FD} resembles the expected rate of growth (plus one) in real final demand.
The equations listed so far result in k^*. The 'gap' equals the difference between k^* and the stock of capital that would result if no net investments were planned (k^e_{t+1}). That is, gap = $k^* - (k - i_{t-\Theta} + i_t)$.[7)]

Finally, the traditional approach assumes the net investment decision (i_D) to equal a fixed proportion (<1) of gap, disregarding a possible disutility connected with changes in the capital stock (risk).
As an alternative, we introduce here an investment behaviour based on an amended version of the "non-Euclidic profit theory" as found in Hartog [1979, p.225], where the optimal size of the firm (i.e., the optimal capital stock) is established via a utility-approach.
In that approach, utility increases (degressively) with expected profits and decreases (more than proportionately) with the amount of capital involved. Amended for our problem, we assume that entrepreneurs are "conservative" in the sense that deviation of the capital stock from its present level yields disutility. This disutility grows more than proportionately with the deviation concerned. Reasons for the disutility are given in the introduction. It could also be based on the existence of financial or social adjustment costs (Kort [1988]) or on technical barriers (Jorgenson [1963]) progressively connected to changes in k.

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7) In the remainder, when we speak of 'the gap' we refer to this definition.

Still, utility grows less than proportionately with expected profits. Concrete, we assume the following utility-function:

$$(10) \qquad U = C_1 \cdot \left[\frac{Y_R^e + C_2}{Y_R + C_2}\right]^{0.8} - C_3 \cdot (|dk|)^4$$

where Y_R^e represents current (net) profits plus the (net) cost reduction expected to follow from a (partial) move towards k*, and Y_R resembles current net profits. C_1, C_2 and C_3 are constants.[8)]

(10) fulfills the requirements $\frac{\delta U}{\delta Y_R^e} > 0$, $\frac{\delta U^2}{\delta^2 Y_R^e} < 0$, $\frac{\delta U}{\delta |dk|} < 0$ and $\frac{\delta U^2}{\delta^2 |dk|} < 0$.

The alternative investment hypotheses are visualised in Figure 1.

[Insert Figure 1, added in the back]

The curve 'd(U) = 0' resembles combinations of net (dis)investments and expected profits (Y_R^e) that yield the same level of utility. OC indicates the estimated 'gap' (in absolute terms) between actual and cost minimizing stocks of capital. If investments fully close this gap (implying $|dk|$ = OC), the expected increase in profits equals DC. Investment hypotheses based on profit maximization therefore (cumulatively) lead to OC as net investments, where cet. par. a new stationary equilibrium results. With profit optimization, however, net investments are determined by the point where the increase in utility (by virtue of higher expected profits) is outweighed by the decrease in utility (due to higher net (dis)investments). In Figure 1 in that case net investments equal OE. Depending on the relative weights in (10), the gap may never be closed.

When applying equation (10), for each marginal unit of investment, say

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8) C_2 should be such that the factor in brackets is positive. The final term in (10) could also be stated in relative terms. As in the calculations below k does not fluctuate much, this possibility is neglected.

a_ι[9], the expected reduction in production costs is calculated as the expected reduction in labour costs minus the expected increase in capital costs (both in net terms).
For each "step" ι (extra marginal investment) the expected reduction in labour costs equals (with ι = 1...200 and a_0 = 0)

$$(11)^{10)}\quad P_L^e \times \left[\left[\frac{y^e}{\beta_0}\right]^{1/\beta}\left[\underbrace{\left[k_{t+1}^e + \sum_{b=0}^{\iota-1} a_b\right]^{(1-1/\beta)}}_{(A)} - \underbrace{\left[k_{t+1}^e + \sum_{b=1}^{\iota} a_b\right]^{(1-1/\beta)}}_{(B)}\right]\right]$$

whereas the increase in expected costs of capital, equals

$$(12)^{11)}\quad P_k^e \times \sum_{b=0}^{\iota} a_b$$

For each step, the increase in utility is calculated along the lines provided by (10). Step j which does not increase this level is left out when determining total planned net investments, i_D, as

$$(13)\qquad i_D = \sum_{\iota=1}^{j-1} a_\iota$$

As well as the profit maximizing investment behaviour, this optimizing approach implies a positive relation between the size of the gap and the investments. But it seems more plausible than the former, as it entails the following likely features:
-of a small |gap| a larger proportion is 'closed' by net (dis)investments

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9) Equal to 0.005 gap. That is ι = 1, 2, 3, ... 200. For covenience, the description in the main text is restricted to $a_\iota > 0$, but the resulting formulas also apply to $a_\iota < 0$.

10) The outcome of (11), is positive for a > 0 and negative for a < 0.

11) A policy raising the expected price of capital, raises (12) and consequently reduces OE in Figure 1. Investments obtained in the profit maximizing approach would also shrink, but now because of a drop in k*. See eq. (7). In both cases curve 1 bows inward.

-a firm incurring losses (or modest profits) will be more anxious to reach the cost minimizing stock of capital than a firm making (higher) profits, i.e., it implies a plausible asymmetry.

Technically, this asymmetry is produced by $\delta U^2/\delta^2 Y_R^e < 0$, as well as by the denominator in the first term (both: equation 10): the higher current net profits, the lower the increase in utility caused by a certain expected cost reduction.

These two features, not embodied in the traditional profit maximizing approach, favour an investment behaviour based on profit optimization. The next section deals with the macro-economic consequences of these alternative investment hypotheses.

III Simulations[12)]

Each of both above mentioned advantages of the profit optimizing approach over the traditional profit maximizing one, has its own macro-economic implications.

The first one leads to a continuous cyclical development in endogenous key variables in the economy, as opposed to a return to a (possibly new) trend value if the profit maximizing investment behaviour is assumed. This effect is illustrated by means of a (world-wide) government expenditure increase under profit maximizing and profit optimizing investment behaviour, respectively.

The sequence of events if investments are a fixed proportion of 'gap' is summarized as follows. The extra demand immediately raises output prices and output (eqs. (1) and (5)), i.e., to an increase is nominal output. As a consequence, expected nominal demand also increases, causing a rise both in expected supply (y^e, see eq. (8)) and in the expected output price level. The former (increase in y^e) implies an outward shift of the iso-quant, pushing k* up (see eq. (7)). At given y^e, this increase in k* is mitigated by the latter (increase in P_y^e) as an increase in the expected

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12) The simulations presented here are based on the coefficients $\beta = 0.8$, $\Theta = 5$, $\varepsilon = 0.08\emptyset$, $C_1 = 1000$, $C_2 = 2$ and $C_3 = 0.5$. Other coefficients produced qualitatively indentical results.

price level implies an increase of the expected rental price of capital, but this second effect can be shown to be smaller. As the 'gap' is positive, net investment are obtained.
The capacity effect of those investments will first of all shift the expected supply curve to the right as soon as the expected macro-economic stock of capital starts to grow (k^e, see eq. (9)), which presses expected output prices down. This reduces k^* and hence narrows the gap. The gap also shrinks as a result of the net investments themselves (k^e_{t+1} rises if i goes up). As soon as k^* falls below the expected stock of capital, the gap turns negative and the above reasoning is reversed.
A long run equilibrium is established were actual and cost minimizing stocks of capital coincide and, consequently, net investments are zero. As both the starting position and the new equilibrium are long run stationary equilibria, i.e., in both situations average production costs are minimized, and since the production function is of the Cobb-Douglas type, the initial labour and capital coefficients are restored. In the new equilibrium supply has adjusted to increased demand at the original output price level.

This sequence of events is altered as soon as risk is introduced in the entrepreneurial utility function.
Still, the increased demand invokes investments. But the extent to which these investments fill the 'gap' is now higher when the gap is smaller: of a small |gap| a larger proportion is filled. The proportion approaches unity if the gap approaches zero, whereas in the above profit maximizing approach this fraction was constant.
This different behaviour implies that application of (10) leads to a larger 'overshooting' by k of k^*, a phenomenon illustrated in Figure 2.

[Insert Figure 2, added in the back]

This figure displays the ratio k/k^* for both alternative investment hypotheses. If the ratio exceeds 1, k overshoots k^*; if it is lower than 1, k

undershoots k^*. In the periods immediately following the impulse, k^* rises, but k is still unaffected in both cases.[13] This results in initial undershooting. After a delay, k follows k^* and overshoots k^* in both cases. But profit optimization (eq. (10)) leads to a larger overshooting than profit maximization.
A higher degree of overshooting has as a consequence that the remaining gap is now more negative. k shrinks in order to adjust to the low k^*. By the same token, if investments follow (10), k undershoots k^* to a relatively large extent, etc.
Whereas the gap between actual and cost minimizing capital stocks vanishes with the symmetric investment function (in other words, as indicated there, net investments cumulatively equal OC in Figure 1), it continuously returns if (10) applies. As this cyclical pattern in the stock of capital is reflected in the other economic variables and as it is not found if the remainder of the model is combined with a profit maximizing investment approach, we conclude that, if investments are also determined by risk, the economy may not return to a (new) stationary equilibrium after an impulse.

Moreover, once this business cycle is obtained, it is no longer neutral with regard to the average (trend) values of economic variables, as a result of the asymmetry signaled above.
Over the business cycle, a large (small) capital stock coincides on the one hand with a large (small) supply of products, low (high) output prices and losses (profits), and on the other hand with a negative (positive) gap. At the same time, the utility function (10) implies that entrepreneurs are more eager to get a cost reduction if losses (cq. modest profits) are incurred than if profits are high.
Combining the two, a high value of k causes the (negative) gap to be filled (with disinvestments) relatively fast. But if k is small, the positive gap (calling for net investments) will be filled relatively slowly: entrepreneurs are less anxious for a cost reduction.
As a result, a high k is reduced more quickly than a low k is raised and the average value of the capital stock is harmed by the business cycle: a

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13) Due to the decision lag and installation lag.

negative supply shock. The trend value of the capital stock shrinks relative to the one of production. And given the shape of the production function, the opposite holds for employment.
These and other effects of this phenomenon are illustrated in Table 1, where under different assumptions the trend values (i.e., the average values over a 'steady cycle') for some key variables are shown following a fiscal expansion.[14]

[Insert Table 1, added in the back]

As points of reference, columns 1 and 2 give the initial values and the trend values obtained with a profit maximizing investment function, respectively. Comparison of these columns with the remaining ones (where eq. (10) is applied) shows that in trend values in the latter:

- the capital stock is lower than the one that results in minimization of production costs ($k < k^*$); (columns 1 and 2: $k = k^*$)
- the capital intensity of the production process is lower than its initial level, the labour intensity is higher; (columns 1 and 2: both equal 1)
- whereas initially as well as in column 2 they equal 1, output prices rise (as a result of a relatively low stock of capital) to such an extent that the initial income distribution is restored.

Other impacts of the negative supply shock are traced by comparison of specific columns. Comparison of columns 4 and 3 learns, that, as result of $\dot{k} < \dot{y} < \dot{\ell}$, with an expansionary impulse, employment grows faster than output and with a contractionary impulse, it falls less. In both instances, firm output is lower than the one obtained if risk is not a determinant of investments.[15]
If only country 1 expands (column 5), in the home country similar effects are found. The more interesting effects are, however, found abroad, i.e.,

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14) 'Gi' refers to a world-wide change in government expenditures and 'G1' indicates that government expenditures change in country 1 only.

15) In the latter case, output falls to 99.41 if Gi = -10% (not included in table 1).

in countries 2, 3 and 4. As (the effects on) those countries are identical, only the ones experienced by country 2 are reported (right half column 5).

Foreign countries experience two impulses: a positive influence (positive demand impulse, see their exports), and a negative one caused by the creation of a business cycle which reduces their average stock of capital and as such reduces supply (negative supply impulse). The former increases output, capital formation and employment, the latter reduces the capital stock and, consequently, reduces output (to a smaller extent) and employment (to an even more limited extent). -Moreover, the supply shock increases their output price level.- On balance, the capital stock falls, output falls (less) and employment and prices rise. Although the former three of these effects are the outcome of opposite impulses and, as a consequence their sign might change, we can nevertheless conclude, however, that under these circumstances a fiscal expansion cannot simply be labelled 'sustaining' anymore, even though exchange rates are fixed.

With a profit maximizing investment behaviour, a temporary increase in demand has no long run effects, as capital formation in that situation is symmetric. But with the asymmetric investment equation, such a policy does influence the trend values. The wave produced by the impulses again functions as a negative supply shock: the average stock of capital falls and output and employment fall with it. See columns 6 and 7, both reporting the trend values following a 10% increase in government expenditures in a certain period and an opposite impulse in the subsequent period. In column 6 all countries act in this respect, in column 7 only country 1 intervenes. Apart from some rounding errors, regardless of which country/countries intervene(s), the average long run results in all countries are identical as the demand effect of the impulse is cancelled out. The supply effect -a shrinking capital stock as a result of the created business cycle- remains, and with it, in all countries, the negative effects on capital formation, output and employment, as well as the price increasing effects.

We conclude, that, if an asymmetric investment function applies, for example because of the fact that risk co-determines investment behaviour, and a government wants to avoid negative supply shocks, it should not function as a 'shock-maker' but as a 'shock-breaker'.

IV Conclusions

We presented a four country macro-economic model with flexibel output and flexibel prices, assuming 'weakly rational' expectations. This model was combined with one of two alternative investment hypotheses: a traditional profit maximizing one, where investments do not depend on risk, and a profit optimizing one, where both profit expectations and risk determined investment plans. Several features of the latter made it more likely than the former. Inclusion of this profit optimizing investment approach appeared to change drastically the macro-economic effects of fiscal policy, for example. It implied a continuously returning business cycle (as opposed to the establishment of a new stationary equilibrium) following an impulse. Furthermore, business cycles appeared to have negative (as opposed to neutral) effects on capital formation, output and employment, as well as price increasing effects. These effects are experienced to an equal extent in all countries, regardless of the question if the country concerned initiated the wave or not.
Finally, we concluded, that, if an asymmetric investment function applies and a government wants to avoid negative supply shocks, it should not function as a 'shock-maker', but as a 'shock-breaker'.

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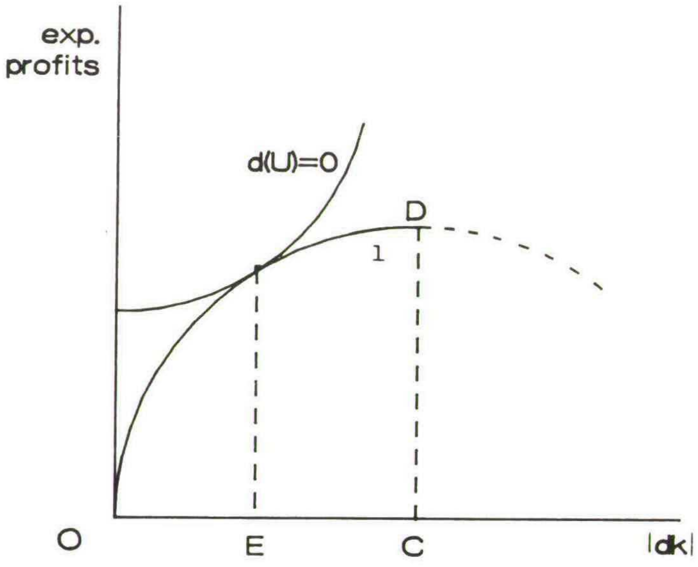

Figure 1

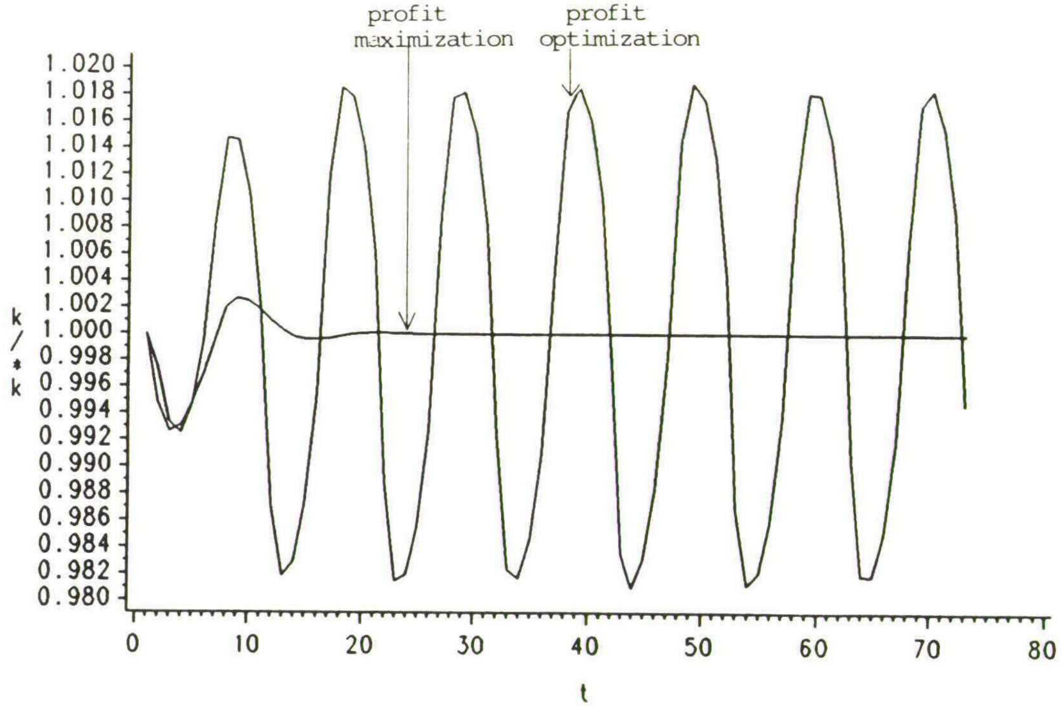
profit
maximization
profit
optimization
1.020
1.018
1.016
1.014
1.012
1.010
1.008
1.006
1.004
1.002
1.000
0.998
0.996
0.994
0.992
0.990
0.988
0.986
0.984
0.982
0.980
k/*k
0
10
20
30
40
50
60
70
80
t

Figure 2

1		2		3		4	
Starting position		Gi = 10 % id = 0.25 * gap		Gi = 10 % id = f(U)		Gi = -10 % id = f(U)	
Y1	100.000	Y1	100.590	Y1	100.580	Y1	99.3999
CO1	60.0000	CO1	60.0566	CO1	60.0532	CO1	59.9396
I1	20.0000	I1	20.1179	I1	20.1125	I1	19.8766
EX1	16.0000	EX1	16.0151	EX1	16.0142	EX1	15.9839
M1	16.0000	M1	16.0151	M1	16.0142	M1	15.9839
PY1	1.00000	PY1	1.00000	PY1	1.00006	PY1	1.00006
PL1	0.80000	PL1	0.80000	PL1	0.80000	PL1	0.80000
L1	100.000	L1	100.590	L1	100.586	L1	99.4061
K1	100.000	K1	100.590	K1	100.562	K1	99.3821
YL1 N	80.0000	YL1 N	80.4717	YL1 N	80.4688	YL1 N	79.5249
YR1 N	0.00000	YR1 N	-.00000	YR1 N	0.00382	YR1 N	0.00411
UN1	2.98211	UN1	2.51322	UN1	2.51623	UN1	3.45501
KOPT1	100.000	KOPT1	100.590	KOPT1	100.577	KOPT1	99.3980
Y1 E	100.000	Y1 E	100.590	Y1 E	100.583	Y1 E	99.4023
PY1 E	1.00000	PY1 E	1.00000	PY1 E	1.00006	PY1 E	1.00007
PK1 E	0.20000	PK1 E	0.20000	PK1 E	0.20001	PK1 E	0.20001

5				6		7			
G1 = 10% id = f(U)				Gi = 10% temp. id = f(U)		G1 = 10% temp. id = f(U)			
Y1	100.559	Y2	99.997	Y1	99.990	Y1	99.990	Y2	99.990
CO1	60.0512	CO2	59.9971	CO1	59.9965	CO1	59.9965	CO2	59.9965
I1	20.1086	I2	19.9958	I1	19.9947	I1	19.9947	I2	19.9948
EX1	15.9993	EX2	16.0040	EX1	15.9991	EX1	15.9991	EX2	15.9991
M1	16.0136	M2	15.9992	M1	15.9990	M1	15.9991	M2	15.9990
S1 N	-.01437	S2 N	0.00479			S1 N	0.00000	S2 N	-.00000
PY1	1.00006	PY2	1.00006	PY1	1.00006	PY1	1.00006	PY2	1.00006
PL1	0.80000	PL2	0.80000	PL1	0.80000	PL1	0.80000	PL2	0.80000
L1	100.565	L2	100.003	L1	99.996	L1	99.996	L2	99.996
K1	100.542	K2	99.981	K1	99.974	K1	99.974	K2	99.974
YL1 N	80.4519	YL2 N	80.0026	YL1 N	79.9969	YL1 N	79.9969	YL2 N	79.9969
YR1 N	0.00378	YR2 N	0.00387	YR1 N	0.00388	YR1 N	0.00390	YR2 N	0.00383
UN1	2.53306	UN2	2.97957	UN1	2.98521	UN1	2.98523	UN2	2.98513
KOPT1	100.557	KOPT2	99.994	KOPT1	99.988	KOPT1	99.988	KOPT2	99.988
Y1 E	100.562	Y2 E	100.000	Y1 E	99.993	Y1 E	99.993	Y2 E	99.993
PY1 E	1.00006	PY2 E	1.00006	PY1 E	1.00006	PY1 E	1.00006	PY2 E	1.00006
PK1 E	0.20001	PK2 E	0.20001	PK1 E	0.20001	PK1 E	0.20001	PK2 E	0.20001

mbols: See main text. Moreover, 1 = country 1, 2 = country 2,
S = trade balance, UN = rate of unemployment, KOPT = k*.

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